



Australian Government

Department of the Environment and Heritage

Assessment of the
Torres Strait Prawn Fishery

November 2005

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This document is an assessment carried out by the Department of the Environment and Heritage of a commercial fishery against the Australian Government Guidelines for the Ecologically Sustainable Management of Fisheries. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 10, 13 and 13A of the Environment Protection and Biodiversity Conservation Act 1999. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Australian Government.

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Assessment of the ecological sustainability of management arrangements for the Torres Strait Prawn Fishery

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
Background.....	1
Overall assessment.....	4
Recommendations.....	5
PART I - MANAGEMENT ARRANGEMENTS	7
Conclusion	10
PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES. 11	
STOCK STATUS AND RECOVERY	11
<i>Maintain ecologically viable stocks.....</i>	<i>11</i>
Information requirements	11
Assessment	12
Management response.....	14
Conclusion	16
<i>Promote recovery to ecologically viable stock levels</i>	<i>16</i>
Conclusion	17
ECOSYSTEM IMPACTS	17
<i>Bycatch protection.....</i>	<i>17</i>
Information requirements	17
Assessment	18
Management response.....	18
Conclusion	19
<i>Protected species and threatened ecological community protection</i>	<i>19</i>
Information requirements	19
Assessment	20
Management response.....	21
Conclusion	21
<i>Minimising ecological impacts of fishing operations</i>	<i>21</i>
Information requirements	21
Assessment	22
Management response.....	22
Conclusion.....	23
REFERENCES	24

Index of Tables

Table 1: Summary of the Torres Strait Prawn Fishery.....	1
Table 3: List of acronyms.....	25

EXECUTIVE SUMMARY

Background

The Australian Fisheries Management Authority (AFMA) has submitted documents for assessment of the Torres Strait Prawn Fishery (TSPF) under Parts 10, 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

On 24 November 2002 the Minister for the Environment and Heritage (the Minister) signed an Agreement with AFMA to initiate the strategic assessment of the fishery. Following public consultation, *Terms of Reference for the Environmental Assessment of the Torres Strait Prawn Fishery* were adopted. The draft document, Torres Strait Prawn Fishery Assessment Report (the submission), was received by the Department of the Environment and Heritage (DEH) in November 2003. The document was released for a 30 business day public comment period that expired on 19 January 2004. Two public comments were received. AFMA provided a response to the issues raised and amended the submission where necessary. The Torres Strait Protected Zone Joint Authority (PZJA) approved the submission in February 2005 and a final submission for assessment was received on 24 February 2005.

The submission reports on the TSPF against the Terms of Reference, including the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission, associated documents, public comments and AFMA's response to the comments.

Table 1: Summary of the Torres Strait Prawn Fishery

Area	The fishery is located in the eastern section of the Torres Strait Protected Zone and comprises approximately 8,000 km ² or 20% of the area of the Zone.
Fishery status	The fishery has been considered fully exploited since the early 1990s
Target Species	Brown tiger prawns (<i>Penaeus esculentus</i>) and blue endeavour prawns (<i>Metapenaeus endeavouri</i>) – minor catch of red spot king prawns (<i>Penaeus longistylus</i>)
Byproduct Species	Main byproducts are squid (<i>Photololigo</i> spp.) and Moreton Bay bugs (Genus <i>Thenus</i>) Limits are imposed on retention of finfish and shark. Retention of rock lobster, dugong, turtles, tuna, coral, trochus and beche-de-mer, mudcrab and barramundi is prohibited.
Gear	Otter trawl quad gear (two pairs of nets) with 88m of net
Season	1 March to 30 November.
Commercial harvest 2004	1,336 t of prawns, comprising 592 t of brown tiger prawns, 668 t of blue endeavour prawns, and 72 t of king prawns.
Value of commercial harvest	\$18.6 million in 2004
Recreational harvest	Negligible
Commercial licences issued (Oct 2003)	77 entitlements, of which 71 are currently tied to vessels (6 are in "No Boat" status). 59 licences/boats were active in the fishery in 2004.
Management arrangements	Input controls including limited entry, transferable licences, allocated fishing access days, vessel length restrictions, boat replacement policy, net length restrictions, mesh size restrictions.
Export	Yes. The majority of catch is exported.
Bycatch	Highly diverse with over 260 species; finfish comprise 78% by weight
Interaction with threatened species	Mainly turtles, seasnakes and syngnathids

The TSPF operates in the eastern section of the Torres Strait Protected Zone (TSPZ) and the defined 'outside but near'¹ area. The TSPZ was established in 1985 by the Torres Strait Treaty (the Treaty) negotiated between Australia and Papua New Guinea (PNG) and specifies areas where Australia and PNG have jurisdiction over certain marine species, including prawns. The TSPZ was established to protect the traditional way of life and livelihood of the traditional inhabitants of the area, including traditional fishing and free movement rights between the two countries, and to enable the orderly development of commercial fishing. The Treaty also requires Australia and PNG to protect and preserve the marine environment and indigenous flora and fauna of the area.

The fishery is bounded to the west by the Warrior Reef complex, the east by the reefs surrounding Darnley Island, the north by the border of the TSPZ and the south by the common border of the 'outside but near' area and the Great Barrier Reef Marine Park. The area of the fishery is around 8,000 km² or 20% of the area of the TSPZ. The fishery operates in both Queensland and Commonwealth waters and is managed by the PZJA established under the *Torres Strait Fisheries Act 1984* (TSF Act). The PZJA membership consists of the Commonwealth and Queensland fisheries ministers and the chair of the Torres Strait Regional Authority (TSRA). The TSF Act is the primary mechanism through which Australia gives effect to the fisheries provisions of the Treaty. AFMA, in cooperation with the Queensland Department of Primary Industries and Fisheries (DPI&F), coordinates and delivers fisheries management and surveillance/enforcement programs in the TSPZ on behalf of the PZJA.

The fishery targets brown tiger prawn (*Penaeus esculentus*) and blue endeavour prawn (*Metapenaeus endeavouri*) and to a lesser extent red spot king prawn (*Penaeus longistylus*). Species currently retained by the fishery as byproducts include squid, Moreton Bay bug (bugs), fish and sharks. Limits are imposed on the retention of finfish and shark while catch of the key byproduct species (squid and bugs) is unrestricted, although a size limit applies to Moreton Bay bugs. Retention of rock lobster, dugong, turtles, tuna, coral, trochus and beche-de-mer, mudcrab, pearl shell and barramundi is prohibited.

Prawn species are generally sexually mature at six months and fecundity increases with age. A twelve-month-old female can produce hundreds of thousands of eggs at a single spawning and may spawn more than once in a season. The eggs sink to the bottom after release, where they hatch into larvae within about 24 hours. Less than 1% of these offspring survive the two to four week planktonic larval phase to reach suitable coastal nursery habitats where they may settle onto seagrass beds as juvenile prawns. An unusual feature of the life history of prawns in Torres Strait is that seagrass habitats are mostly located on coral reef platforms such as the Warrior Reef complex. As the juvenile prawns grow, they migrate from seagrass areas into the deeper waters surrounding the reefs and, after one to three months, recruit into fishing grounds as sub-adult and adult prawns.

Brown tiger and endeavour prawns migrate relatively short distances (about 60 nautical miles). The stocks harvested in the TSPF are considered functionally independent of the stocks in the Queensland East Coast Otter Trawl Fishery (QECOTF) and the Commonwealth managed Northern Prawn Fishery (NPF).

The TSPF is the most valuable fishery in the Torres Strait. In 2004, 1,336 t of prawns, valued at \$18.6 million, were harvested in the TSPF. The fishery employs an estimated 300 people directly but few of these are Torres Strait Islanders, although the PZJA has reserved three licences in the TSPF for use by Torres Strait Islanders. Under the catch sharing provisions of the Treaty, PNG is entitled to up to 25% of the prawn catch in the TSPZ minus the 25% share of the catch Australia has forgone in the PNG area of jurisdiction. To give effect to this provision, Australia has agreed to endorse up to 7 PNG prawn trawlers to operate in the TSPF. However, only a few PNG vessels have sporadically participated in the TSPZ and their areas of operation have been confined to PNG

¹ When part of a fisheries stock under joint management arrangements with Papua New Guinea belongs substantially to the TSPZ but also extends outside but near the Zone, the Treaty allows Australia and Papua New Guinea, in adopting a management plan, to apply the plan in those areas.

waters (north of the fisheries jurisdiction line). Socio-economic benefits flow from the TSPF to mothership operators and a range of land-based industries including agents, prawn buyers, processors and exporters, transport operators, shipyards and maintenance yards etc.

Up until ratification of the Treaty the fishery was managed as a part of the former Queensland East Coast Fishery. Under those arrangements approximately 1200 licences were authorised to fish in Torres Strait. Few of these licences were used in the TSPF, however their existence represented significant latent effort. Prior to ratification of the Treaty the main management arrangements that applied to the fishery were an industry-initiated spatial closure to protect juvenile prawns on the western side of the Warrior Reefs and a ban on trawling for lobsters. In December 1984, a seasonal closure of the entire fishery was introduced as a management strategy aimed at optimising the size of prawns.

Under the Treaty the prawn fishery was designated as a jointly managed (Australia and PNG) fishery requiring the setting of an 'allowable catch' (AC) that equates to the optimum sustainable yield of the fishery. The AC of the prawn fishery is now set as the 'catch of the fishery'. In 1989 Australia and PNG agreed to use input controls as the basis for catch sharing arrangements.

At the time the Treaty was ratified 453 vessels had obtained endorsements to operate in the TSPF. In 1987 the PZJA introduced limited entry management for the fishery and limited entry to those operators who had a prior history in the fishery. This action reduced the number of authorised vessels to 150. In 1989, a freeze on licence transfer was implemented and by June 1992 the number of authorised vessels had been reduced to around 110. Only 10 to 20 vessels fished for more than seven months (210 days) of the year. However, the potential capacity of the fishery was around 30,250 fishing days, far greater than the highest actual level ever recorded (11,907 days in 1992).

In 1993 the management arrangements were reviewed, largely because of the inability to enforce the freeze on licence transfers. As a result of the review, "days of fishing access" were attached to each licence in order to cap effort in the fishery at 13,570 days and provide a mechanism for reducing boat numbers. Under these arrangements, operators may sell off all of their days of access and cancel licences. As a result, the number of authorised vessels had decreased to 77 by 2002.

Area and seasonal closures remain important management measures in the fishery keeping sensitive areas free from trawling and allowing protection of 'nursery' areas. After ratification of the Treaty the West of Warrior spatial closure for juvenile prawns was extended to all of the western side of the TSPZ. In 1990 a strip closure to the east of Warrior Reefs along with a three-month seasonal closure was implemented. The seasonal closure was designed to ensure effective harvesting of the prawn stocks in all subsequent years, taking seasonal variation into account.

Vessels tow 4 conical-shaped nets spread open by two steel or timber otter boards separated by sleds over the seabed. All nets used in the TSPF must be fitted with an approved turtle excluder device (TED) and, from 1 March 2004, a bycatch reduction device (BRD) which allows fish and other animals to escape from the net immediately after capture.

Information on the composition and abundance of bycatch in the fishery relies on scientific surveys by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) conducted in 1985-86 and 1997. The surveys indicate that bycatch consists mainly of small fish (78% by weight), invertebrates (16%), sharks and rays (4%) and turtles and sea snakes (2%). The diversity was found to be high with at least 250 species of fish and 14 of elasmobranchs. The taxonomic resolution of the invertebrate taxa is poor, potentially masking high diversity. The TSPF bycatch also includes turtles, sea snakes and syngnathids, which are protected. Catch rate estimates are available for turtles from logbooks. However, estimates for sea snakes and syngnathids are limited, and they are also rarely identified to species level. Interactions with protected species are assessed under Principle Two of this report.

There is no recreational prawn catch due to the remoteness of the TSPF and the characteristics of the fishery (no estuary nurseries). Likewise, the indigenous catch is negligible. The management

arrangements for the fishery, as agreed by the PZJA under the TSF Act, are published annually in the Torres Prawn Handbook.

Overall assessment

The material submitted by AFMA demonstrates that the management arrangements for the TSPF meet most of the requirements of the Australian Government Guidelines for the ecologically sustainable management of fisheries.

While the fishery is relatively well managed, DEH has identified a number of risks that must be managed to ensure that their impacts are minimised:

- The absence of a robust assessment model for all target and byproduct species;
- The absence of precautionary harvest strategies for target and byproduct species;
- The absence of management objectives, performance criteria and performance measures and a mechanism for regular review of the management regime;
- The significant level of latent effort in the fishery and the threat this poses to the tiger prawn stock, in particular, which are already fully exploited;
- The lack of validated catch data for target and byproduct species; and
- The high rates of bycatch and uncertainty with the extent and composition of bycatch.

Recommendations to address these issues have been developed to ensure that the risk of impact is minimized in the longer term. Through the implementation of the recommendations and the continuation of a responsible attitude to the management of the fishery, management arrangements are likely to be sufficiently precautionary and capable of controlling, monitoring and enforcing the level of take from the fishery while ensuring the stocks are fished sustainably.

The management regime aims to ensure that fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. On balance, the fishery is being managed in an ecologically sustainable manner and is working to address existing problems and minimise environmental risks.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements specified in the TSPF management regime, DEH considers that the fishery will not be detrimental to the survival or conservation status of the taxon to which it relates in the short term. Similarly, it is not likely to threaten any relevant ecosystem in the short term. DEH therefore recommends that the fishery be declared an approved Wildlife Trade Operation (WTO) with the actions specified in the recommendations to be pursued by the PZJA to contain the environmental risks in the long term. DEH considers that the fishery, as managed in accordance with the management regime is not likely to cause serious or irreversible ecological damage over the period of the export decision. Specifically, the WTO declaration would allow the export of product from the fishery for a period of three years. The WTO declaration will require annual reporting on the progress of implementing the recommendations of this report and other managerial commitments. The implementation of the recommendations will be monitored and reviewed as part of the next DEH review of the fishery in 3 years time.

As the official fishery area encompasses Commonwealth as well as State waters, consideration under Part 13 of the EPBC Act is required regarding the impact of the fishery on listed threatened species, listed migratory species, cetaceans and listed marine species.

Protected species occurring in the fishery area include marine turtles, sea snakes and syngnathids, dugongs, whales and other cetaceans and seabirds. The TSPF interacts with these species to varying degrees, but primarily with marine turtles, sea snakes and syngnathids. Experience in other fisheries, namely the NPF, suggests that the introduction of TEDs in 2002 and BRDs in 2004 will make significant reductions in the capture of turtles and sea snakes. CSIRO surveys indicate that syngnathids are rarely caught in the fishery, however the risk to these species is dependent on the relative proportion of the populations taken by trawling which is presently unknown. The actual and potential impact on Part 13 species under the management arrangements is considered low and adequate protection is provided. There are no listed threatened ecological communities in the fishery area.

DEH considers that the fishery to which the regime relates does not, or is not likely to, adversely affect the survival in nature of listed threatened species or population of that species, or the conservation status of a listed migratory species, cetacean species or listed marine species or a population of any of those species. DEH also considers that the regime requires that all reasonable steps are taken to avoid the killing or injuring of protected species, and the level of interaction under current fishing operations is negligible. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the regime would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

Part 10 of the EPBC Act requires that Commonwealth managed fisheries undergo strategic assessment to determine whether actions taken in the fishery have a significant impact on the environment in Commonwealth Marine Areas. Under this Part, the Minister may accredit a management plan to exempt actions taken in accordance with the management plan from further impact assessment approval.

DEH considers, *inter alia*, that there has been adequate assessment of the impacts that actions approved in accordance with the management regime, as prescribed under the TSPF Statement of Management Arrangements, have, will have or are likely to have on the marine environment. DEH also considers that actions approved or taken in accordance with the management regime will not have unacceptable or unsustainable impacts on the marine environment in a Commonwealth area. DEH therefore recommends that, in accordance with Part 10, the TSPF Statement of Management Arrangements be accredited under section 33 of the EPBC Act for the matter of national environmental significance “the marine environment”.

The implementation of the following recommendations and other commitments made by the PZJA in the submission will be monitored and reviewed as part of the next DEH review of the fishery in 3 years time.

Recommendations

1. DEH to be informed of any proposed amendment to the management regime for the Torres Strait Prawn Fishery to enable DEH to evaluate any impact on the ecological sustainability of the fishery.
2. PZJA to continue to ensure that consultative processes are conducted in a manner that ensures the timely implementation of management responses essential for the sustainability of the fishery.
3. PZJA to develop and apply fishery specific management objectives, performance indicators and performance measures for target, key byproduct, bycatch and protected species and ecosystem impacts. PZJA to ensure that adequate information collection systems are put in place to monitor performance against indicators.

4. PZJA to develop a clear process for determining the reason for a performance measure being triggered and for implementing appropriate management measures within specified timeframes.
5. PZJA to develop within 1 year a strategy and timeframes for implementing any resultant recommendations arising from the formal compliance risk assessment.
6. PZJA to report annually on performance of the fishery against specified objectives and measures, once developed, with the reports to be made publicly available.
7. PZJA will continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all target, byproduct and bycatch species, which may be affected by cross-jurisdictional issues.
8. PZJA, within 12 months, to develop and implement an ongoing robust system to validate effort and catch data on target and byproduct species.
9. PZJ to develop and implement a robust and regular stock assessment process, which estimates key population parameters and quantifies the uncertainty associated with each and provides a basis for risk-based management decisions for each target species, where such an analysis is feasible. For other species, the assessment process will examine the ecological sustainability of the take of target, byproduct and bycatch using qualitative or semi-quantitative risk assessments. Appropriate management responses will be developed to reduce risks to the high-risk species or groups.
10. PZJA to develop and commence by the start of the 2006 fishing season a program to reduce effort to ecologically sustainable levels with clear objectives and timeframes.
11. PZJA will continue to pursue reduction in the amount of bycatch taken in the TSPF through the refinement of bycatch mitigation technology and will investigate methods for increasing the survivability of bycatch species. Any suitable methods identified should be implemented in a timely manner.
12. PZJA to promote research into the impact of the fishery on protected species, including syngnathids and seasnakes, and to take all reasonable steps to reduce protected species interactions.
13. PZJA to develop and implement a spatial management system within the TSPF that takes account of the impacts of fishing on:
 - species and populations identified by the ecological risk assessment process as high risk;
 - important feeding/spawning/breeding/refuge grounds for key target, byproduct and protected species; and
 - benthic habitats

This spatial management system will be integrated with the regional marine planning process for Northern Australia and will ensure that the entire fishery area is taken into account.

PART I - MANAGEMENT ARRANGEMENTS

The TSPF is managed by the Torres Strait PZJA, which consists of the Australian Government (represented by the Minister for Fisheries, Forestry and Conservation), the Queensland Government (represented by the Minister for Primary Industries) and the Chair of the TSRA. The PZJA is responsible for monitoring the condition of Australian fisheries, including the prawn trawl fishery, in the Torres Strait and for the formulation of policies and plans for their management. AFMA, in cooperation with the Queensland DPI&F, coordinates and delivers fisheries management and surveillance/enforcement programs in the TSPZ on behalf of the PZJA and in accordance with the provisions of the TSF Act and the *Torres Strait Fisheries Regulations 1985*. Recreational fishing, including charter fishing, is managed under Queensland law.

Details of the management regime are described in the following documents, all of which are publicly available:

- Torres Prawn Handbook 2005.
- the TSPF Bycatch Action Plan 2005.
- the Torres Strait Fisheries Five-year Strategic Research Plan.
- Fisheries Notices issued under the *Torres Strait Fisheries Act 1984*.

There are a number of other documents, including research reports, scientific literature and discussion papers, which are integral to the management of the fishery. Of particular note are the following:

- Torres Strait Prawn Fishery Effort Reduction/Adjustment Discussion Paper, November 2003 (Torres Strait PZJA 2003); and
- Review of the Stock Assessment of the Torres Strait Prawn Fishery (Die 2003).

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the documents identified above to DEH's assessment of the fishery, an amendment to the existing management regime could change the outcomes of our assessment and decisions stemming from it. A range of measures to address current management issues are either under consideration or pending implementation. Decisions on these issues and effective implementation of management actions will have a significant influence on the capacity of the fishery to comply with the *Guidelines for the Ecologically Sustainable Management of Fisheries* that provided the basis for this strategic assessment.

Recommendation 1: *DEH to be informed of any proposed amendment to the management regime for the TSPF to enable DEH to evaluate any impact on the ecological sustainability of the fishery.*

The PZJA receives management advice from the Torres Strait Fisheries Management Advisory Committee (TSFMAC) comprised of Islander, industry and government representatives. A number of working groups, including a Prawn Working Group (PWG) report to the TSFMAC. Scientific Advice is received from the Torres Strait Scientific Advisory Committee (TSSAC). Significant management papers are made available publicly on the AFMA web site and distributed to interested parties. DEH considers the level of consultation to be generally adequate. However, DEH believes that the consultative mechanisms would be enhanced by the inclusion of a conservation representative on the TSFMAC.

Timely decision-making is critical for good management. DEH notes that the PZJA has allocated considerable resources to the fisheries consultative structure recognising that it is the backbone for decision-making. A process is underway to up-skill the members of the consultative bodies and this will continue to take more resources.

Recommendation 2: *PZJA to continue to ensure that consultative processes are conducted in a manner that ensures the timely implementation of management responses essential for the sustainability of the fishery.*

The PZJA has adopted the following broad objectives for the TSPF:

- To control effort in the fishery and provide for catch sharing to occur with PNG;
- To achieve a level of fishing effort which is consistent with conservation and optimum use of the Torres Strait prawn resources; and
- To encourage traditional inhabitants of the Torres Strait to participate in the Prawn Fishery.

These objectives are to be achieved in a manner that avoids damage to other fisheries and the marine environment. There are no stated management objectives, performance measures and performance criteria in respect to specific target, byproduct and bycatch species or protected species and ecosystem impacts. DEH regards this as a serious deficiency and considers that specific management objectives, performance criteria and performance measures be formalised and applied. These should be incorporated into the proposed Torres Strait Prawn Management Plan when developed. DEH notes the development of fisheries specific objectives, performance indicators and performance measures through the PWG. DEH strongly encourages the development of specific performance indicators and measures linked to specific monitoring programs for tiger prawns, endeavour prawns, red spot king prawns, squid and Moreton Bay bugs. These should also be developed for other species as new market opportunities are detected.

Recommendation 3: *PZJA to develop and apply fishery specific management objectives, performance indicators and performance measures for target, key byproduct, bycatch and protected species and ecosystem impacts. PZJA to ensure that adequate information collection systems are put in place to monitor performance against indicators.*

Agreed processes for responding to breaches, plus a commitment to timely response action, are critical for sustainable management. DEH notes that no such mechanisms are currently in place in the TSPF.

Recommendation 4: *PZJA to develop a clear process for determining the reason for a performance measure being triggered and for implementing appropriate management measures within specified timeframes.*

Management of the fishery is based on a range of input controls including:

- Limited entry
- Transferable licences
- Allocated and transferable fishing access days
- Boat replacement policy
- Permanent area closures
- Gear restrictions
- Bag and size limits
- Seasonal closures

These arrangements have been successful in preventing overfishing of target species. However, a significant pool of latent effort persists. Activation of such effort could result in the main target species, which is currently considered fully fished, becoming overfished and have detrimental impacts on byproduct and bycatch species, the status of which is less certain. The management arrangements, through the specification of fishing access days, provide a mechanism through which latent effort can be removed. Further discussion on effort controls is included in Part II of this report.

Compliance and enforcement arrangements in the TSPF tools implemented in the fishery are undertaken by DPI&F's Queensland Boating and Fisheries Patrol on behalf of the PZJA.

The surveillance and enforcement program has relied upon an at-sea surveillance program together with radio reporting of vessel entry and exit from the fishery in order to monitor fishing access days. A Vessel Monitoring System (VMS) was implemented in the fishery in March 2004, requiring hourly reporting of vessels. DEH considers that this high level of reporting will protect the integrity of closed areas as well as effectively monitoring fishing access days.

Concerns were raised during the public comment period regarding the level of compliance and enforcement in the fishery. DEH notes that AFMA has completed a compliance risk assessment that should address this matter. However, no timeframes for development and implementation of the risk assessment have been provided. DEH considers that effective enforcement and compliance are essential to ensure that management measures are not undermined.

Recommendation 5: *PZJA to develop within 1 year a strategy and timeframes for implementing any resultant recommendations arising from the formal compliance risk assessment.*

The PZJA Annual Report describes PZJA activities in, and the condition of, the TSPF. The most recent report available on AFMA's web site is for 2002-03. AFMA also provides a brief overview of its involvement in the TSPF in its annual report. Neither of these reviews involves an assessment of the fishery against specific performance criteria. Until such time as the Management Plan is implemented, the PZJA should report annually on performance of the fishery against specified objectives and measures, once developed, with the reports to be made publicly available. The proposed Torres Strait Prawn Management Plan should also provide for the regular review of management arrangements and their assessment against specified performance criteria.

Recommendation 6: *PZJA to report annually on performance of the fishery against specified objectives and measures, once developed, with the reports to be made publicly available.*

Fishery-dependent and independent data relating to the target species are collected on a regular basis in the fishery. Discussion of the information collection systems can be found in Part Two of this report.

An analysis of the fishery's capacity for assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates is contained in the discussion under Principle II of this report.

The joint management arrangements for the fishery between Australia and PNG facilitate the development of consistent management arrangements in the two jurisdictions. The target prawn stocks in the TSPF are considered to be functionally independent from those in other fisheries. However, there is overlap of species and vessels between the TSPF, the NPF and the QECOTF, and the TSPF takes a range of other species such as squid, bugs, finfish and shark that are likely to have shared stock implications with other fisheries in northern Australian waters. This is acknowledged to some extent in developing management arrangements for the TSPF. For example, the revised TSPF Bycatch Action Plan (BAP) closely follows the recent review of the NPF BAP and the proposed management arrangements for the QECOTF. The membership of both Commonwealth and Queensland on the PZJA facilitates the development of consistent and complementary management arrangements across jurisdictions. AFMA, Western Australia, Queensland and Northern Territory also participate in the annual Northern Australian Fisheries Management Workshop (NAFMW) which provides a forum for State, Federal and Territory fishery agencies to address the status and future research and management priorities of commercially important species across northern Australia and identify and pursue complementary management activities.

Ideally, management arrangements affecting single stocks should be under a single jurisdiction, or at least complementary across jurisdictions. DEH believes it would be beneficial, particularly for PZJA governance, for the PZJA to continue to be involved in cross-jurisdictional actions to address shared stock concerns.

Recommendation 7: *PZJA will continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all target, byproduct and bycatch species, which may be affected by cross-jurisdictional issues.*

DEH considers that the current management arrangements comply with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. DEH expects that AFMA will also ensure compliance with any future plans or policies as they are developed, such as the proposed Threat Abatement Plan for Injury and Fatality to Vertebrate Marine Life caused by Ingestion of, or Entanglement in, Harmful Marine Debris.

The fishery is influenced by a range of domestic programs and policies, in addition to those specific to the TSPF. Of particular significance is the Recovery Plan for Marine Turtles in Australia. In April 2001 bycatch of sea turtles during coastal otter trawling operation in Australian waters north of 28°S was listed as a key threatening process under the EPBC Act 1999. The Recovery Plan contains specific actions aimed at mitigating this threat. The compulsory use of TEDs, handling instruction to maximise survival of any captured turtles, fishing practices including fishing primarily at night and short shot duration when fishing during the day and permanent and seasonal closures to protect seagrass areas indicate that the fishery is managed in accordance with the measures contained in the Plan.

The Torres Strait Treaty is the primary regional instrument underlying management of the TSPF. The relationship between the Treaty and management of the TSPF has been outlined above. The prime international regime affecting the fishery is the United Nations Convention on the Law of the Sea. The management regime essentially complies with this. Other international regimes are applicable to fisheries management but do not explicitly involve this fishery, for example the 1992 Convention on Biological Diversity and in particular the 1995 Jakarta Mandate requiring that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the submission, the fishery's compliance with their requirements can be assessed by examination of Part II of this report. The application of the International Convention for the Prevention of Pollution from Ships (MARPOL) to vessels operating in the fishery is explicitly discussed Part II of this report under Principle 2, Objective 3.

DEH considers it is incumbent on all authorities to develop a thorough understanding of the framework of national, regional and international agreements and their applicability to export-based fisheries for which they are responsible.

Conclusion

DEH considers that the TSPF management regime is documented, publicly available and transparent, and is developed through a consultative process. The means of enforcing critical aspects of the management arrangements are provided for. The management regime takes into account arrangements in other jurisdictions, and adheres to arrangements established under Australian laws and international agreements.

However, DEH believes that the absence of specific management objectives, performance criteria and performance measures that can be publicly reported on, and the absence of defined response processes to address the outcomes of performance measurement and compliance risk assessment systems, significantly affect the certainty with which the effectiveness of the management arrangements against the Guidelines can be assessed. DEH considers that management arrangements need further refinement concerning these and other aspects of management and has provided a number of recommendations for improvements.

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

Principle 1: *‘A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover’*

Maintain ecologically viable stocks

Objective 1: *‘The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability’*

Information requirements

Fishery dependent data have been obtained through compulsory daily logbooks since 1989. The current catch and effort data are collected through an identical logbook used in the NPF and similar to the QECOTF logbook. A new daily fishing logbook – NP14 – was introduced in 2004 for both the TSRLF and NPF. The recorded data include the total catch weight of each target species, equipment used, hours trawled, the location of the greatest catch and byproduct species taken. The submission indicates that recording of byproduct by species, quantity and location taken has been compulsory in TSPF logbooks since 1998. Prior to that, byproduct data was recorded on a voluntary basis. The data indicate that Moreton Bay bugs and squid are the main byproduct and a range of invertebrates, such as cuttlefish, crabs, scallops, and other finfish are also taken.

While data is routinely checked for outliers the logbook data has not been independently validated. The use of unloading dockets and mothership tally sheets for validating logbook data is being investigated. An observer program commenced in the fishery in March 2005 to monitor and validate the amounts and composition of target, bycatch and by-product species and to develop a system of verification of logbook data. AFMA intend to conduct a second round of observer trips in the TSPF in August 2006.

DEH acknowledges the efforts being made to strengthen the data collection process. The stock assessment relies heavily on catch and effort data derived from logbooks, and given the importance of caps on total effort as a key management measure and the intent of the current management objectives for the TSPF of controlling effort in the fishery to ecologically sustainable levels, it is therefore important that a robust and ongoing process is in place to ensure catch and effort data is independently validated.

Recommendation 8: *PZJA, within 12 months, to develop and implement an ongoing robust system to validate effort and catch data on target and byproduct species.*

Fishery independent recruitment surveys have been conducted at the start of each fishing season since 1998. These surveys are conducted by QDPI&F and samples from over 70 sites spread from Cape Flattery in northern Queensland to PNG waters. Data provided by these surveys include fishery independent indices of recruitment at the start of the season; species and sex composition information; information on size structure of the prawn stocks; and, in some years, information on bycatch.

The Torres Strait fisheries research program is designed to identify and investigate key biological parameters of fish stocks in the Torres Strait and to provide advice on which to base rational and effective fisheries management programs. Research in TSPZ fisheries is coordinated through the TSFSAC. AFMA has committed \$450,000 per year until 2005/06 to the recently established Torres

Strait Cooperative Research Centre (CRC) for research into the marine environment, major commercial fisheries and traditional fishing in the Torres Strait. The TSSAC is also developing a new five-year research plan for all Torres Strait fisheries including the TSPF. The Queensland DPI&F project, "Towards Ecologically Sustainable Management of the Torres Strait Prawn Fishery" which has been underway since 1985 and provides the basis for the assessment of the stock and effectiveness of management measures in the TSPF, has now been incorporated into the Torres Strait CRC. The project aims to:

- Monitor the status of target species using both annual research surveys and commercial catch and effort data obtained from industry via logbooks and unloading records;
- Further develop stock assessment models that can be used to assess both biological reference points for target species and various management options that are aimed at ensuring harvest levels are sustainable (management strategy evaluation (MSE)); and
- Assist with developing cost-effective ways of monitoring bycatch and other environmental impacts of prawn trawling.

DEH believes that the information collection system for target species is appropriate to the current scale of the fishery and will be strengthened by continued development of validation measures as suggested in **Recommendation 8**.

Assessment

Formal assessments of Torres Strait prawn stocks have been undertaken periodically since 1991. In 1994 a long term sustainable yield for the fishery was estimated as 1900 tonnes, comprising 680 tonnes for tiger prawns, 1035 tonnes for endeavour prawns and 185 tonnes for king prawns, although these estimates are subject to variations in stock recruitment and fishing effort. The Bureau of Rural Sciences notes that sustainable yield estimates for the three main prawn species have ranged from 1370 tonnes to 2850 tonnes (Williams 2004).

Annual catch and effort figures for tiger, endeavour and king prawns are published and assessed each year in the Torres Prawn Handbook. For 2004, the total catch (1,336 tonnes) and effort (6,768 fishing days) were well below the last 10 and 5 year averages (1,788 tonnes, 9,582 fishing days and 1,797 tonnes, 9,936 fishing days respectively). However, the 2004 catch of tiger prawns of 592 tonnes was only 10% below the 10 year tiger prawn average catch of 660 tonnes, while the king prawn catch of 72 tonnes was close to its 10 year average of 74 tonnes. Catch per unit effort (CPUE) for tiger prawns has been rising steadily since 2000 and is well above the 10 year CPUE average for this species. In contrast, the 2004 endeavour prawn catch of 668 tonnes is well below its 10 year average catch of 1,051 tonnes. While endeavour prawn CPUE in 2004 increased slightly to reverse the steady fall in its CPUE rate since catch peaks in 1999, CPUE for this species is still below its 10 year average.

Despite the higher catch levels of endeavour prawns, the formal stock assessment process is focused on tiger prawns, as they are considered to be more vulnerable to intensive fishing than endeavour prawns. Stock assessment models have been developed and progressively refined for tiger prawns, with the recently developed delay-difference model for tiger prawn stocks now the preferred assessment model for the fishery. The Fisheries Research and Development Corporation funded project "Reference point management and the role of catch-per-unit-effort in prawn and scallop fisheries" further addressed estimations of maximum sustainable yield (MSY) and the fishing effort that would catch MSY (E_{MSY}) in the TSPF. The stock assessment process is periodically subject to independent peer review, most recently in 2003 by an international stock assessment expert, Dr David Die, who commented on the high quality of scientific advice and analysis involved in the stock assessment process along with the need for further refinement to reduce uncertainties in assessments (Die 2003).

MSY for tiger prawns has recently been estimated at around 665 tonnes using standardised data, or 700 tonnes using unstandardised data (Williams 2004). The 2003 stock assessment provided a best

estimate of E_{MSY} of 9,200 fishing days which, when compared with catch and effort records over recent years, indicates that tiger prawn stocks are being fully fished at recent levels of fishing effort but are not being overfished. However, the submission notes that the current stock assessment model also predicts that, if current levels of effort are maintained, that tiger prawn stocks will fall below the level of biomass that produces MSY. The current allocation of 13,396 fishing days for the TSPF is also well in excess of recent effort levels in the fishery and provides significant potential for sustainable catch estimates to be exceeded and overfishing to occur if this potential effort is activated.

The uncertainty with effort levels, along with the need to further refine sustainable catch limits for the target species, emphasises the importance of obtaining reliable and validated catch and effort data to increase the robustness of the stock assessment process (see **Recommendation 8**).

The current stock assessment assumes that there is a single stock on both sides of the Australia/PNG line. Tagging studies and monthly survey work in the TSPF during the late 1980s and early 1990s suggest that the stocks harvested in the TSPF can be considered functionally independent of QECOTF and NPF stocks.

DEH believes that the arrangements provided under the Torres Strait Treaty for joint management of the stocks are suitable to ensure effective management of a single stock across the Australian and PNG jurisdictions. The decision to manage the prawn stocks in the TSPF separately to those in other Australian fisheries appears to be adequately supported by the scientific data currently available.

There are no current stock assessments for the other target species, endeavour prawns or king prawns. Recent findings (Die 2003) based on preliminary CPUE data suggest that prawn fishing in the TSPF has had no detectable effects on the endeavour prawn stock. The PZJA has indicated that it will investigate the opportunity to increase the endeavour prawn catch to determine if increased catches can be achieved without also increasing catch of tiger prawns and without expanding the area in which the fishery currently operates. The PZJA notes that this will require the development of a stock assessment model for endeavour prawns (Torres Strait PZJA 2003) and the submission notes the intention to standardise catch and effort data for use in an endeavour prawn stock assessment model. DEH supports the early development of such a model and cautions that any examination of the impacts of the expansion of catch of endeavour prawn should include the potential impact on both byproduct and bycatch species.

The 2004 catch levels for king prawns have returned to the 10 year average after unusually high catch levels and catch rates in 2002 and 2003. While there are no indications from the catch trends that king prawn stocks being overexploited, the stock status remain uncertain and DEH considers that further work should be done to develop a more formal analysis of the stock status.

DEH supports the work currently being done to improve the assessment of target species and views this as a priority area for further refinement as increased knowledge about the fishery is obtained.

No formal assessments have been undertaken or reference points established for byproduct species in the TSPF. DEH acknowledges that assessment of byproduct species is difficult due limited biological information available on many of these species and a limited time series of continuous logbook byproduct data. AFMA is undertaking ecological risk assessments (ERAs) for all Commonwealth fisheries that will assess the risks of fishing impacts on all ecological components of the fishery, including byproduct and bycatch species. Following the ecological risk assessment, to be completed by May 2006, the PWG have committed to the development of appropriate management responses for high risk species within 12 months of the completion of the ecological risk assessment. DEH considers that the outcomes of the ERA process should be useful in highlighting more formal assessments that should be conducted on byproduct species as further catch and effort data and biological information becomes available.

Overall, DEH considers the assessment processes employed in the TSPF to be adequate for the key target tiger prawn species, but in need of improvement or more regular application for the other target prawn species and byproduct species generally.

DEH recommends that the PZJA develop a more robust fishery assessment process for the TSPF that periodically examines the ecological sustainability of the harvest of target and byproduct species and bycatch. This process should use the best available information from logbooks, VMS, research and observer surveys, incorporating estimates of effort creep and should adopt various levels of risk and a precautionary approach to estimating sustainable catch limits and setting sustainable effort levels.

Recommendation 9: *PZJA to develop and implement a robust and regular stock assessment process, which estimates key population parameters and quantifies the uncertainty associated with each and provides a basis for risk-based management decisions for each target species, where such an analysis is feasible. For other species, the assessment process will examine the ecological sustainability of the take of target, byproduct and bycatch using qualitative or semi-quantitative risk assessments. Appropriate management responses will be developed to reduce risks to the high-risk species or groups.*

Current removals from the TSPF include commercial harvest of target and byproduct species, including harvest from PNG commercial vessels, bycatch (discards) of the commercial fishery and mortality incurred by interaction with commercial fishing gear. The submission notes there is no indigenous catch of prawns and the remoteness of the fishing grounds and methods of prawn fishing restricts the potential for recreational catches. Commercial removals of target and byproduct species are recorded in logbooks. DEH has recommended earlier in this report (see **Recommendation 8**) the ongoing validation of this data. Logbook data on PNG catch is provided by the PNG National Fisheries Agency and is considered in the stock assessment process for the TSPF.

Bycatch data is not generally collected in logbooks, however interactions with protected species, including the condition of the animal when released, must be recorded. Some bycatch information is collected from the annual, fishery-independent recruitment surveys, however this information is not reported. As noted earlier in this report, an observer program that commenced in the fishery in 2005 will provide an updated indication of the composition and extent of byproduct and bycatch species in the fishery. There are no estimates available of mortality incurred by interaction with commercial fishing gear.

Management response

The submission refers to the use of MSY and E_{MSY} as the benchmark against which the fishery has been assessed. However, there are no clear target and limit reference points defined for this fishery. The 2003 independent review of the stock assessment identified this as a deficiency and made high priority recommendations for both limit and target reference points to be adopted and for management strategies aimed at reaching target reference points to be tested against the proposed MSE framework developed for the fishery (Die 2003). The submission acknowledges that target reference points below the past maximum production limits of MSY and E_{MSY} are desirable given the uncertainty in MSY and E_{MSY} estimations and the risk that catch and effort levels to date may be depleting stocks below maximum sustainable biomass limits. DEH has previously recommended in this report the development of performance indicators and performance measures for target and key byproduct species (see **Recommendation 3**) and suggests that the establishment of more precautionary reference points be addressed in the context of developing the relevant performance measures and indicators.

DEH notes that the PZJA has committed to addressing Dr Die's recommendations as quickly as possible given funding constraints. In particular the PZJA has indicated that the PWG should develop the MSE criteria so that MSEs can be performed on strategies proposed by the PWG. DEH supports this approach.

The current TSPF management regime aims to maintain ecologically viable stock levels through a range of input controls such as area and seasonal closures, effort capping, gear and boat restrictions and limited entry, and some output controls such as possession and size limits. These measures are outlined in Table 1 and Part I of this report.

A substantial proportion of the fishery is subject to both permanent and seasonal closures. Seasonal closures from 1 December to 1 March apply for the entire fishery, and from 1 December to 31 July for an area east of Warrior Reef, to support recruitment of prawns into the fishery. Permanent closures applying to areas west of Warrior Reef and around Darnley Island to minimise the impacts of trawling on traditional fishing also provide further protection for prawn stocks. Effort caps were introduced into the fishery in 1993 in the form of allocation of a quota of transferable fishing access days that limits each vessel's total time in the fishery each season. The restructuring of the fleet and operations within the TSPF as a result of this effort reduction strategy has seen the fishery reduce from 110 licensed vessels with a potential of over 30,000 fishing days in 1992 down to 77 entitlements and 13,396 allocated total fishing days in 2005.

DEH considers that the combination of the input controls and output controls has the capacity to provide adequate protection of the target stocks and provide some protection to byproduct and bycatch species. However, as discussed previously in this report, assessments of the fishery indicate that key target species are close to full exploitation at the existing levels of fishing effort, which are around 40% below the maximum nominal effort available to the fishery. The restriction of effort and the implementation of measures to remove the potential for latent effort to be activated need to be high priorities to prevent overfishing in the TSPF. Concerns regarding latent effort in the fishery were also raised during public comment.

DEH notes that the PZJA has acknowledged that "to ensure the long term sustainability of the stocks there will need to be a reduction in the amount of effort in the fishery." (Torres Strait PZJA 2003). DEH notes that a number of proposals to reduce allocated fishing access days are under consideration, but that no decision has yet been taken.

DEH notes that the TSPFWG has given commitments to address effort reduction strategies through alternative management workshops in 2005 and DEH considers that priority should be given to implementing the outcomes of this workshop and developing and implementing an effective effort reduction program.

Recommendation 10: *PZJA to develop and commence by the start of the 2006 fishing season a program to reduce effort to ecologically sustainable levels with clear objectives and timeframes.*

The primary byproduct species caught are Moreton Bay bugs and squid. Logbook records of byproduct landings over recent years indicate that these two species groups comprise around 95% of TSPF byproduct. As previously noted in this report, formal stock assessments have not been undertaken for byproduct species in the TSPF, nor have harvest limits or reference points been established. DEH has recommended the development of performance indicators and measures for key byproduct species (see **Recommendation 3**) and enhancements in assessing the sustainability of byproduct stocks (see **Recommendation 9**). Recommended action concerning future effort limitation in the TSPF (see **Recommendation 10**) should also assist with curtailing the extent of bug and squid catch.

In response to concerns for the status of Moreton Bay bugs, a minimum size limit of 75 mm carapace width was introduced in the TSPF in 2002. This limit was implemented by a Fisheries Notice under the TSF Act. Similar action could be taken in response to concerns for other byproduct species. Public comment noted that catches of squid are an important subsistence food source for traditional inhabitants. Harvesting of species such as squid is likely to have cross jurisdictional implications in northern waters. Concerns were raised in the NAFMW in September 2002 that increasing fishing pressure and opportunistic targeting of squid in fisheries around the coast could significantly affect the status of shared stocks. DEH acknowledges that catches of squid

are highly variable and, given the lack of knowledge regarding the biology of the species, assessment of the stock is difficult. However, DEH also notes that a requirement of the strategic assessment of the NPF is to develop a biologically based harvest limit for squid. This is being considered by the NAFMW and could have benefits for the assessment of squid in the TSPF. DEH has previously recommended that the PZJA cooperate with other jurisdictions in pursuing complementary research and management arrangements of shared stocks such as squid (see **Recommendation 7**).

Management measures apply to other byproduct species in the TSPF. Byproduct limits are imposed on the catch of finfish and sharks and there are prohibitions in place on the retention of barramundi, tuna species under Commonwealth jurisdiction, dugong and turtles, pearl shell, tropical rock lobster, coral, trochus, beche-de-mer and mudcrab. While the retention of other species as byproduct is unlimited, the compulsory use of TEDs and BRDs in the fishery should assist in reducing the extent of byproduct as well as bycatch. The extent of seasonal and permanent fishery closures also provides a certain degree of protection for byproduct species.

Conclusion

DEH considers that the tiger prawn stock is not currently overfished, and if overfishing should occur in the future, the fishery is conducted such that there is a high degree of probability the stock would recover. However, the absence of stock assessments and reference points for the other target and byproduct species prevents an assessment as to whether these stocks are overfished. Lack of validated catch data for both target and byproduct species, together with uncertainties surrounding sustainable catch limits and the need to further limit both actual and potential effort across the fishery, indicates that improvements in several areas are required to ensure that the management regime further reduces the risk of over-fishing.

DEH considers that there is a need to further refine some of the existing information collection, assessment and management responses and has provided a number of recommendations for improvements over the three year period of this approval.

Promote recovery to ecologically viable stock levels

Objective 2: *‘Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes’*

While none of the stocks in the fishery have been identified as being overfished at recent harvest levels, DEH has concerns that previous stock assessments indicate that tiger prawn stocks are being fished to the limit of MSY and that no formal assessments have been undertaken or reference points established for other target or byproduct species.

DEH has made a number of recommendations in this report regarding the need to develop performance indicators and measures, along with adequate information collection systems, for target and key byproduct species (see **Recommendation 3**), conduct a more robust fishery assessment process (see **Recommendation 9**) and ensure that effort levels in the fishery are managed at ecologically sustainable levels (see **Recommendation 10**), and expects that through the implementation of these recommendations, stock levels will be managed at more precautionary levels.

DEH notes the commitment of the PZJA to reducing effort in order to ensure that overfishing does not occur.

Conclusion

DEH notes the uncertainty surrounding the status of species other than tiger prawns and expects that the suite of recommendations made in this report will assist the PZJA in managing these stocks at a more precautionary level.

Ecosystem impacts

Principle 2: *'Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem'*

Bycatch protection

Objective 1: *'The fishery is conducted in a manner that does not threaten bycatch species'*

Information requirements

The submission acknowledges that data are not available to provide a recent robust estimate of total bycatch in the fishery. Available information on bycatch composition and abundance in the TSPF is derived from CSIRO scientific surveys conducted in 1985-86 and 1997. These surveys indicated bycatch levels of around 6930 t in 1985 and 4630 t in 1986 and highlighted a wide diversity of bycatch with at least 250 species of fish and 14 of elasmobranchs. The most commonly caught fish species were identified as lizard fish or grinders, bigeye, leatherjackets and monocled bream. The submission notes that, since effort is likely to have increased since those surveys, and assuming catch rates of bycatch have remained the same, the total amount of bycatch is likely to be higher than the 1985-86 estimate derived from the CSIRO scientific surveys.

The collection of information on bycatch of threatened, endangered and protected species is discussed under Objective 2.

The existing logbooks provide for recording of protected species interactions and for capture of sharks, however there is no specific provision for recording of other bycatch species. DEH concurs with AFMA's assessment that given the high number of species taken as bycatch and the difficulties attached to identifying these species accurately the use of logbooks for collection of species specific data is not likely to be practical or effective.

The revised TSPF BAP (Torres Strait PZJA 2004) includes a commitment to ensure that the amount and composition of bycatch in the TSPF is monitored. The BAP identifies observer programs as the primary strategy for quantifying bycatch in the fishery. An observer program commenced in the fishery in 2005 with observers spending a total of 83 sea days on 6 vessels to monitor and verify catches. Results of the 2005 observer program are currently being collated and will be made available to stakeholders. Further sea days of observer monitoring are scheduled for 2006. DEH supports the ongoing development and implementation of this observer program as a key element in effectively monitoring the amount and composition of bycatch over time and providing the basis for further assessing the vulnerability of key bycatch species and habitats that may be impacted by the fishery.

The BAP also indicates that targeted research programs will be used to collect information on bycatch. The submission notes that the observer program should enable further research in key areas such as obtaining up-to-date estimates of bycatch composition and catch rates, including improved identification of elasmobranchs and invertebrates; evaluation of the effectiveness of the introduction of BRDs and TEDs on reducing bycatch and species specific exclusion by these devices; and identification of species that are least likely to be sustainable and filling gaps in knowledge that affect the assessment of species' sustainability. DEH notes that the previously mentioned DPI&F project "Towards Ecologically Sustainable Management of the Torres Strait

Prawn Fishery" includes a component to assist with development of cost-effective ways of monitoring bycatch and other environmental impacts of prawn trawling.

Assessment

The 1985-86 CSIRO surveys indicated that bycatch in the TSPF consisted mainly of small fish (78% by weight), invertebrates (16%), sharks and rays (4%) and turtles and sea snakes (2%). Subsequent analysis of bycatch in the TSPF (Harris and Ward, 1999) noted that bony fish comprise up to 69% of bycatch in the fishery, followed by 8% as crabs, 3% as scallops, 1-3 % as various species of sharks and rays and 1% as various species of squid, tropical rock lobster, bugs, sponges and turtles and 0.1-0.2% as sea snakes. The submission includes the results of a risk assessment of bycatch species based on data and research in both the TSPF and the NPF. The risk analysis identified five species of finfish that were ranked as highly susceptible to capture and least likely to be sustainable due to their benthic or demersal nature and preference for soft/muddy sediments. The lack of information about these species influenced their low sustainability ranking. Seven species of finfish taken as bycatch were identified as being likely to be sustainable.

The risk analysis did not include an assessment of elasmobranchs, which are generally more susceptible to overfishing than bony fish. A range of elasmobranch species are recorded in the TSPF. The submission notes that, of these, the pristids (sawfishes) and the benthic species (wobbegongs and rays) are likely to be of most concern due to their high susceptibility to fishing mortality and a lack of information available to estimate their recovery. DEH notes that reporting of shark bycatch is not compulsory in the TSPF except in relation to protected species. DEH also notes that the new BAP makes no reference to the need to implement actions included in the draft Australian National Plan of Action for the Conservation and Management of Sharks.

The submission acknowledges that the use of NPF data may also constrain the application of the risk analysis to the TSPF. DEH concurs with the submission's assessment that the collection of additional targeted information from the TSPF would enable more criteria and fishery specific information to be included. Appropriate information should be pursued through the bycatch monitoring strategies to be progressed as part of the BAP.

As previously noted in this report, AFMA is conducting ERAs for all Commonwealth fisheries to assess the risks that a fishery poses to the sustainability of species and habitats that it interacts with. The TSPF ERA will be a crucial step in the future management of bycatch and fishing impacts in the fishery. DEH notes that AFMA expects the ERA for the TSPF to be completed by May 2006. The BAP includes a commitment to develop appropriate management responses for high risk species within 12 months of the ERA's completion. DEH expects AFMA to ensure that the ERA process closely examines the risks to elasmobranchs and other at risk species identified by the bycatch risk analysis and implement appropriate management responses, including monitoring arrangements, where required.

DEH notes that the BAP has committed to the development of threshold reference points for indicator bycatch species by March 2006 and the development of management responses when these threshold reference points are reached. The ERA process should provide the impetus to identify the key indicator species and appropriate reference points and management responses. DEH has recommended earlier in this report the development of performance indicators and measures for key bycatch species, supported by adequate information collection arrangements (see **Recommendation 3**).

Management response

The previous BAP was implemented in the TSPF in 1999 with the aims of minimising the catch of large non-retained animals such as turtles and reducing substantially the ratio of bycatch to prawns. The most significant bycatch reduction actions taken in the TSPF in recent years have been the

introduction of the requirement, in 2002, for all operators to use TEDs and, from March 2004, the compulsory use of BRDs. Studies in the NPF have shown that BRDs and TEDs virtually eliminated catches of turtles and other large animals and reduced general bycatch. The submission notes the need for some caution in extrapolating these results to the TSPF since differences in ecosystems trawled, type of fishing vessels, gear and weather conditions may affect the performance of BRDs. Notwithstanding this, DEH regards the implementation of compulsory use of TEDs and BRDs as a significant and effective measure to reduce bycatch.

DEH strongly supports on-going monitoring of the effectiveness of TEDs and BRDs in the TSPF and notes that the modification of fishing gear to minimise turtle and other bycatch, including the further trialing and development of TEDs and BRDs, is one of the key strategies in the new BAP. The BAP also includes strategies to maximise the survival of bycatch, including the development of codes of conduct to advise on post capture handling procedures for turtles, sea snakes, sharks and other significant bycatch species. This may include the use of on deck hoppers or similar devices to reduce the mortality of bycatch.

DEH notes that one of the primary aims of the BAP is to substantially reduce the ratio of bycatch to target prawn catch and considers that the PZJA should give continuing priority to developing and implementing further bycatch reduction measures to ensure that this aim is achieved.

Recommendation 11: *PZJA will continue to pursue reduction in the amount of bycatch taken in the TSPF through the refinement of bycatch mitigation technology and will investigate methods for increasing the survivability of bycatch species. Any suitable methods identified should be implemented in a timely manner.*

A range of other management arrangements are in place to reduce bycatch and impacts on non-target species. Possession bans have been introduced for a range of species and size and catch limits for certain byproduct species are now in place. The predominance of night trawling can reduce the catch of many bycatch species that are far less active at night, while maximising the yield of target species that are more active at night, such as tiger prawns. DEH has some concerns with the increased targeting of squid during the day and the possible resultant changes in bycatch composition and considers this issue should be given further attention under future bycatch monitoring programs. The current permanent and seasonal area closures and the upper limit on effort also contribute to containing the amount of bycatch in the fishery and the impact of fishing on the benthos.

Conclusion

The TSPF has shown a willingness to introduce measures to reduce specific and broader bycatch issues. DEH considers that based on the information currently available, there is a high likelihood the fishery is conducted in a manner that does not threaten bycatch species. DEH is confident that should this situation change, or a risk assessment process indicate otherwise, the PZJA would undertake appropriate actions to ensure that bycatch species are not threatened by this fishery.

Recommendations have been developed to ensure that the risk of unacceptable impact on bycatch species is detected and minimised in the longer term.

Protected species and threatened ecological community protection

Objective 2: *'The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities'*

Information requirements

The TSPF logbooks provide for recording of interactions with protected species. Operators have been required since 1996 to record in their logbooks interactions with turtles. These arrangements

were improved in 2001 with operators required to record in logbooks the catch of turtles, sea snakes and syngnathids caught and their condition when released. Operators are also required to indicate in the logbook whether they interact with any other protected species and if so to complete a detailed wildlife and protected species information sheet. The annual Torres Prawn Handbook and TPPF logbooks also include details on suggested handling practices to enhance the survival of turtles caught during prawn trawling, and the handbook also includes details on turtle identification.

DEH notes that one of the biggest barriers to successful commercial reporting of protected species interactions is the capacity of the fishers to identify the species involved. The BAP includes an action to collaborate with other prawn fisheries to develop educational and information packages about bycatch, including protected species.

The submission acknowledges that logbook data is unlikely to provide an accurate estimate of the catch rate of turtles across the entire fishery fleet. The BAP provides for the new observer program in the TSPF to give particular focus to monitoring and validating protected species interactions.

The submission notes that priority for protected species research in the TSPF will be given to obtaining robust estimates of catch rates and population size estimates or indexes for sea snake and syngnathid species and evaluating the effectiveness of TEDs and BRDs.

Assessment

A wide range of protected species occur in the fishery, including turtles, seabirds, whales and other cetaceans, syngnathids, sea snakes and dugongs. Available information indicates that the TSPF interacts with six species of turtles, with the most commonly caught species the flatback turtle (*Natator depressus*), at least one species of sea snake and at least two species of syngnathids that are protected.

Logbook data since the introduction of TEDs in 2002 suggest a significant reduction (13 in 2002 compared to 213 in 2001) in capture of turtles. The submission notes that no interactions have been recorded with dugongs, possibly because most of the prime dugong habitats of seagrass in the TSPF are closed to prawn trawling. Past research surveys indicate that sea snakes and syngnathids have very low catch rates in the TSPF. However, the submission notes that the risk to these species is dependent on the relative proportion of the populations taken in trawling and that is unknown. The new observer program should provide additional information on the composition and extent of protected species catch in the fishery.

DEH considers that the observer data, along with the outcomes of the ERA process, should be used to promote further research into the impact of the fishery on protected species and to take all reasonable steps to reduce protected species interactions. This should include further research on areas of the fishery where potential impacts are already evident, such as trawling around the major turtle nesting grounds at Bramble Cay. In such cases a desktop analysis of the impacts of the TSPF on the turtle nesting grounds may be sufficient to identify additional management measures required to minimise interactions with local turtle populations.

Recommendation 12: *PZJA to promote research into the impact of the fishery on protected species, including syngnathids and seasnakes, and to take all reasonable steps to reduce protected species interactions.*

There are no listed ecological communities in the fishery area.

While no specific group of indicator species is being monitored at this stage, monitoring activities on bycatch, as specified in the BAP, will focus on protected species and those species identified in the risk assessment as least able to sustain the impacts of trawling. DEH believes that this monitoring should serve to validate the risk assessment and is confident that should impacts be considered unsustainable, management action will be taken.

Management response

Interactions with protected species are primarily managed by the compulsory use of TEDs and BRDs. As with general bycatch, management measures focused on target species, such as closed areas, seasons and an upper limit on effort also reduce the potential for interactions with protected species.

The BAP also includes actions to maximise the survival of bycatch, including protected species such as turtles and sea snakes, through the proposed development of codes of conduct including advice on best practice handling procedures. DEH supports the development of the codes of practice but believes adoption and implementation of the code needs to be monitored and complemented by mandatory management measures where the need is identified.

Conclusion

DEH notes that the introduction of TEDs has significantly reduced the most common interaction with protected species and that the introduction of BRDs will contribute to reducing interactions with syngnathids and seahorses. DEH considers that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities. Should this situation change, or a risk assessment process indicate otherwise, DEH is confident that the PZJA will implement appropriate actions to ensure the fishery avoids mortality or injury to these species and avoids or minimises impacts on threatened ecological communities.

Recommendations have been developed to ensure that the risk of unacceptable impact on protected species is minimised in the longer term.

Minimising ecological impacts of fishing operations

Objective 3: *'The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally'*

Information requirements

Catch and effort data together with trawl location data are collected through compulsory logbooks. Monitoring of the area trawled and frequency of trawling will be enhanced by analysing data collected by VMS, which was implemented in 2004. The CRC for Torres Strait has approved funding for a number of research projects that will contribute to a better understanding of the impact of the fishery on the ecosystem, including mapping the characteristics of key biotic and physical attributes and examining the biophysical processes of the Torres Strait marine ecosystem. Research underway in the NPF may also contribute to this understanding. The pending ERA process will also consider the broader ecological impacts of the fishery.

There is limited information available on the types of benthic communities within the areas trawled in the TSPF. While trawling avoids large reef outcrops it occurs over hard seabed capable of supporting attached animals. Large catches of sponges, for example, were not uncommonly reported. The new observer program provides a mechanism to obtain a more reliable indication of the type and extent of benthos collected by trawling operations in the TSPF.

The submission notes that the recovery rates of benthic organisms following impact by trawling are unknown, but that research elsewhere is underway to estimate this. Research (Poiner *et al.* 1998) has shown that changes to the composition of benthic communities are likely as a result of trawling, with species less susceptible to trawling and with relatively more rapid recovery times, likely to become relatively more abundant following disturbance by fishing activities.

Assessment

The submission identifies the disturbance and mortality of benthic communities, resulting from contact with otterboards and groundchains, as likely to be the main impact of prawn trawling in the TSPF. The impact of the fishery on benthic communities will be a function of the removal/mortality rates per trawl, the intensity of trawl effort, the ability of exposed communities to recover between trawls and on the location of trawling in relation to that of vulnerable seabed communities.

The TSPF may affect food chains through the removal of the target and byproduct species; the capture of bycatch species; and the reintroduction of discard species. Based on work conducted by CSIRO in the NPF, it appears that prawn predators do not rely solely on prawns for their diet, reducing the impact of the removal of target prawn species on predator species. However studies have identified elasmobranchs and fish species that live near or on the seabed, associated with soft sediments and possibly preferring prawns in their diet, as species most likely to be affected by prawn trawling.

The impact of the removal of bycatch species on food chains in the TSPF has not been assessed. The ERA process will address this issue. However, the submission notes that most species taken in large numbers as bycatch in the TSPF occupy low trophic levels characterised by high biomass, variability and turnover rates. These factors may lessen the trophic impact of removal of bycatch species in the fishery. In addition, the relatively small area of the fishery actually fished combined with seasonal closures suggests that significant temporal and spatial refuges are provided for populations affected by the fishery.

The submission identifies discarding of bycatch as an issue of concern, due to its potential to affect competition for habitat and food resources and the relative abundance of some species. The main surface scavengers of bycatch in the TSPF are seabirds, dolphins and sharks and the main benthic scavengers are fish and crabs. The impact on seabirds may be reduced in the TSPF since fishing is predominantly conducted at night while seabirds scavenge during daylight hours. The submission identifies the need for further research into the population dynamics of surface and seabed scavengers and the effect of bycatch issues on the species above and below the scavengers in the food web. The BAP states that should any scavenger species be identified through the ERA process as a high risk of being impacted significantly, a program to monitor the effects of trawling would be established. DEH suggests that an assessment of the impact of discards on key scavenging species, particularly protected species, should be considered as a future area of research in the fishery (see **Recommendation 12**).

The submission identifies changes to sediment or substrate due to trawling activities, and water quality due to introduction of debris and discards of bycatch as the most likely impact of the TSPF on the physical environment. While the submission notes that the area of the fishery is subject to high natural sediment mobility, arising from the frequency of storms and high river discharge in some areas, the additional impact of trawling on disturbance of sediment and re-suspension of sediment is unknown.

Operators in the TSPF are required to comply with MARPOL legislation, reducing the risks associated with the introduction of marine debris.

Management response

Spatial management is well developed in the fishery, with both permanent and seasonal closures in place to protect juvenile prawns, seagrass beds and areas of traditional fishing. DEH notes that management arrangements including the relatively small area of the fishery actively trawled (15%), the upper limit on effort, fishing predominantly at night and the various enforced closures should provide significant temporal and spatial refuges for species, which may reduce the impact of the fishery on the ecosystem generally. The BAP includes actions to prevent expansion of the fishery into untrawled areas and identifying and implementing new area closures where required.

The National Oceans Office (NOO) is currently leading a regional marine planning process in the Northern Region, which encompasses the area of the TSPF. The planning process aims to ensure the ecologically sustainable use of the resources in the planning area and will help to integrate management across jurisdictions and sectors. It will also examine potential candidate areas for the National Representative System of Marine Protected Areas (NRSMPA). The regional marine planning process is a potential vehicle for pursuing sustainable fisheries objectives, particularly where cross-sectoral or cross-jurisdictional approaches are required. Due to significant ecological and institutional differences in the Torres Strait, regional marine planning in that area is being progressed through a separate, but concurrent process, to the overall Northern Region marine planning process.

AFMA and the PZJA should continue to engage in the process as far as practical.

The BAP includes an action to co-operate with the NOO in the development of any representative protected areas within the Torres Strait as part of the regional marine planning process. This process should also draw on recent information collected through the ERA and other relevant projects.

Recommendation 13: *PZJA to develop and implement a spatial management system within the TSPF that takes account of the impacts of fishing on:*

- *species and populations identified by the ecological risk assessment process as high risk;*
- *important feeding/spawning/breeding/refuge grounds for key target, byproduct and protected species; and*
- *benthic habitats*

This spatial management system will be integrated with the regional marine planning process for Northern Australia and will ensure that the entire fishery area is taken into account.

The compulsory use of TEDs and BRDs serves to minimise the impact of the fishery on food chain structure and productivity by reducing the amount of bycatch (and therefore biological material) taken out of the ecosystem. Ongoing work to refine these devices could be expected to further reduce this impact. Monitoring of the spatial distribution of effort and assessment of the impact on benthic communities will be facilitated by the availability of VMS data from 2004.

Impacts on water quality through the discharge of plastic wastes and pollution from vessels are controlled under MARPOL legislation. Operators are required to comply with the legislation and must retain any plastic waste and dispose of it only when the vessel returns to port.

Conclusion

DEH considers that the fishery is conducted in a sufficiently precautionary manner to minimise the impact of fishing operations on the ecosystem generally. Recommendations have been developed to ensure that the risk of significant impact by the fishery on the marine environment generally is minimised in the longer term.

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LIST OF ACRONYMS

AFMA	Australian Fisheries Management Authority
AC	Allowable Catch
BAP	Bycatch action plan
BRD	Bycatch reduction device
CPUE	Catch per unit effort
CRC	Cooperative Research Centre for Torres Strait
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEH	Department of the Environment and Heritage
DPI&F	(Queensland) Department of Primary Industries and Fisheries
E_{MSY}	Level of fishing effort required to achieve MSY
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ERA	Ecological Risk Assessment
MARPOL	International Convention for the Prevention of Pollution from Ships
MSE	Management strategy evaluation
MSY	Maximum sustainable yield
NAFMW	Northern Australian Fisheries Management Workshop
NOO	National Oceans Office
NPF	Northern Prawn Fishery
NRSMPA	National Representative System of Marine Protected Areas
PNG	Papua New Guinea
PWG	(Torres Strait) Prawn Working Group
PZJA	Protected Zone Joint Authority
QECOTF	Queensland East Coast Otter Trawl Fishery
TED	Turtle excluder device
TSF Act	<i>Torres Strait Fisheries Act 1984</i>
TSFMAC	Torres Strait Fishery Management Advisory Committee
TSSAC	Torres Strait Scientific Assessment Committee
TSPF	Torres Strait Prawn Fishery
TSPZ	Torres Strait Protected Zone
TSRA	Torres Strait Regional Authority
VMS	Vessel Monitoring System
WTO	Wildlife Trade Operation